A Polarized Scanning Nephelometer for measurement of ensemble-averaged scattering matrix of aerosol particles: design and validation

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We present a new instrument called Polarized Scanning Nephelometer (PSN) for measuring the complete scattering matrix as a function of the scattering angle of ambient aerosol particles. This design is based on the apparatus developed at the Tohoku University by Zhao [1]. This portable instrument directly measure the ensemble-averaged scattering matrix elements of aerosol particles. In this improved inversion, we can deduce the scattering matrix in a scattering angle range of 4° to 170° at two different wavelengths (445 and 632.8 nm). The accuracy of the instrument is tested by comparing the measured scattering matrices of di-ethyl-hexyl-sebacat and polystyrene spherical particles with Lorenz–Mie calculations. These experiments have demonstrated that our PSN has the potential to measure the complete ensemble-averaged scattering matrix of aerosol particles.

Reference

[1] Zhao, F., 1999: Determination of the complex index of refraction and size distribution of aerosols from polar nephelometer measurements. *Appl. Opt.* **38**, 2331–2336.

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